ON THE CARBON ABUNDANCE IN COMET HALLEY DERIVED FROM THE 3μ FEATURE: COMPARISON WITH INTERSTELLAR DUST

T. Encrenaz[1], J. L. Puget[1,2], L. d'Hendecourt[3]

[1]Observatoire de Paris-Meudon, France
[2]Radioastronomie, Ecole Normale Supérieure, Paris, France
[3]Groupe de Physique des Solides, ENS, Paris France

ABSTRACT

In spite of some similarities with the infrared features observed in the interstellar medium, the 3μ signature observed in comet Halley's spectrum shows two distinct differences, (1) the 3.28μ and 3.37μ cometary features are both in emission, while the 3.37μ interstellar feature is most often observed in absorption; (2) there is no associated emission feature beyond 6μ in the cometary spectrum. These two facts can be simply explained if we assume that the excitation mechanism is resonance fluorescence by the solar IR radiation field. With this assumption, it is found that hydrocarbons are present in roughly equal quantities in both the saturated forms, with a total carbon abundance of about 30% of H_2O.

This carbon abundance can be compared with the abundances derived for the interstellar dust when all condensed (or condensable) components are considered. In comet Halley, from the gaseous phase, we find H:C:N:O = 1.93:0.39<0.08:1.00, while we have, for interstellar dust, C:N:O = 0.50:0.14:1.00, with the condensable hydrogen ranging from 1.4 to 2.2 according to the various models. Assuming that, in comet Halley, 20% of oxygen is trapped in grains (SiO, FeO, MgO...), this comparison suggests that about 40% of C and at least 50% of N is trapped in cometary grains.

Reference: Encrenaz *et al.*, Proceedings of the symposium "On the Diversity and Similarity of Comets," Brussels, April 6-9, 1987, ESA-SP, in press.